2.1 Picturing Motion

Main idea: you can use motion diagrams to show how an object's position changes over time

I. All Kinds of Motion

A. Scientific processes can be communicated through models, graphs, etc. This is critical in order to analyze motion

Sep 21-11:06 AM

B. Changes in Position

1. Motion is all around you

a. objects move in different ways

b. there is a variety in types of motion (straight line, elliptical,)

C. Movement in a straight line

1. follows a path directly between two points without turning left or right

a. description of motion is a description of place and time

Sep 21-11:13 AM

b. you must explain where an object is and at what time in order to clearly communicate motion

II Motion Diagrams

A. representing motion: a series of images are used

B. consecutive images: object in motion is compared to its background: this indicates that the object is in motion

Sep 21-11:17 AM

C. Combining images (a layered image)

1. multiple images with the same background

2. Motion diagram: a series of images showing the positions of a moving object at equal time intervals

III Particle Models

A. It is easier to monitor the motion of an object by keeping track of one point on an object

Sep 21-11:21 AM

B. Particle Model - in a particle model, you replace the object or objects of interest with single points

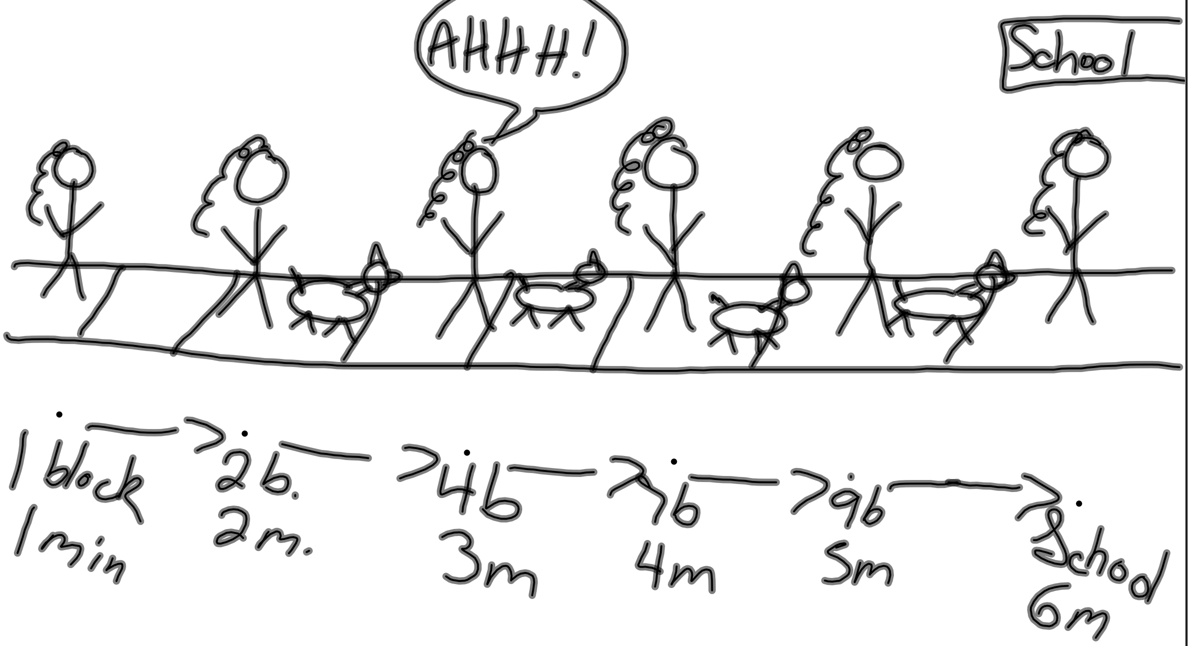
1. common in the study of physics
2. To use a particle model, the object's size must be less than the distance it moves

Sep 21-11:27 AM

A student's house is on the same street as her school 10 block away

After 1min, the student has walked 1 block; after 2min, she has walked 2 blocks; after 3 mins → 4 blocks; 4 mins → 7 blocks, after 5 min → 9 blocks; and after 6 min she reaches her school

Sep 24-9:59 AM



Sep 26-10:39 AM

geraldinescience.wikispaces.com

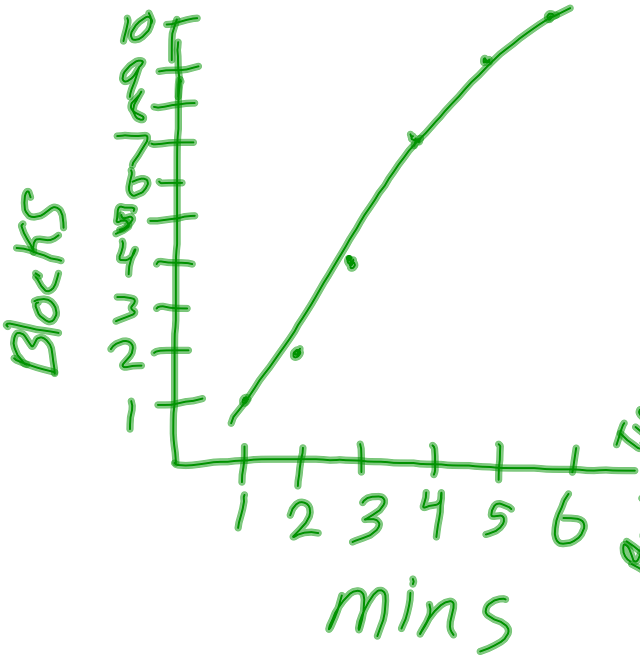
2.2 Where and When?

Main idea: a coordinate system is helpful when you are describing motion

Review vocab: dimension - extension in a direction, One dimensional: along a straight line; three-dimensional (3-D) is height, width, and length

I. Coordinate Systems

Sep 24-12:25 PM



Time	1	2	3	4	5	6
Blocks	1	2	4	7	9	10

Sep 26-10:43 AM

A. Coordinate System: gives the location of the zero point of the variable you are studying and the direction in which the values of the variable move

1. Origin - the point at which all variables in the coordinate system have the value 0

→ Figure 6

a. position - the distance and the direction of an object

b. distance - the entire length of an object's path, even if the object moves many directions

Sep 24-12:30 PM

→ arrow length represents distance

2. Negative position - object is behind point of origin (Figure 7)

II Vectors + Scalars

A. Many quantities in physics have size, which is called <u>magnitude</u>, and direction

B. <u>Vector</u> - a quantity that has both direction and magnitude

Sep 24-12:39 PM

C. Scalar - a number w/out any direction

1. time, temp, etc (examples)

2. Time intervals are scalar (Figure 8)

a. time interval = difference between times

b. $\Delta t = t_f - t_i$

D. Positions and Displacement

1. Displacement - a change in position from initial position to end (final) position

a. $\Delta x = x_f - x_i$ = displacement

b. Figure 9

c. Sometimes a + or - will be used to indicate position

Sep 24-12:46 PM

2.3 Position- time Graphs

Main idea: you can use a position-time graph to determine an object's location at a certain time

Review vocab: intersection: where two lines meet and cross

Sep 25-11:39 AM

I. Position-time graph: the time data is plotted on the horizontal axis and the position on the vertical axis

Example 1

When did the runner whose motion is described in Fig 13 reach 20.0m beyond the starting point
Where was she after 4.5s?

Sep 25-12:52 PM

II Instaneous Position - the position at a particular instant, Instantaneous position is usually just called position

A. Equivalent positions - there could be several ways to represent motion (words, pictures, motion diagrams, data tables, position-time graphs) all of these are known as equivalent positions

III Multiple Objects on a position-time graph

Sep 26-10:47 AM

A. The intersection of two lines on a position-time graph tells you when objects have the same position, however, that does not necessarily mean that they collide

2.4 How Fast?

I. Velocity + Speed

A. The magnitude of displacement in relation to time gives a value for velocity

B. Slope on a position-time graph

Sep 26-10:52 AM

1. The steeper the slope (rise/run) the greater the change in position (displacement) during the time interval

C. Average Velocity

✪ 1. The greater the slope, the greater the velocity

2. Average Velocity equation:

$$a = \overline{V} = \frac{\Delta x}{\Delta t} = \frac{x_f - x_i}{t_f - t_i}$$

✪ b. Average velocity = ratio of an objects change in position to the time interval during which the change occurred

Sep 27-11:43 AM

c. Slope of position-time graph is the average velocity when an object has <u>uniform motion</u>

3. Interpreting Slope

a. Slope of position/time graph indicates both <u>magnitude + slope</u>

4. Average speed

a. a slope's absolute value

b. displacement + velocity of an object are always in the same direction

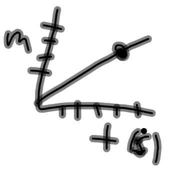
practice problems 27-32

Oct 2-12:39 PM

D. Instantaneous Velocity

1. Instantaneous velocity - the speed and direction of an object at a particular instant
   a. instantaneous velocity = v

E. Average velocity on a motion diagram



1. When an object moves between two points, its average velocity is in the same direction as its displacement
   a. Average velocity is proportional to displacement; as one increases so does the other

Oct 2-12:43 PM

II Equation of Motion

A. Often it is more efficient to use an equation rather than a graph to solve a problem
   1. Objects with a motion of a straight line may use $y = mx + b$
   2. In physics, we use x and t instead of y and x
   3. For a position vs. time graph: the math equation $y = mx + b$ can be rewritten as:

position $= x = \bar{v}t + x_i$

Oct 3-12:54 PM

a. an object's position is equal to the average velocity multiplied by time plus the initial position

Example Problem 4

Known	Unknown
$\bar{v}$ = 12 m/s east	x = ?
x_i = 46 m east	
t = 3.0 s	

Solve for x

$x = \bar{v}t + x_i$

$x = (12 m/s)(3.0 s) + 46 m$

= 82 m east

Oct 3-1:00 PM

N @ 85 km/hr

2.0 km

85 × .25 = 21.25 + 2 km = 23.25 km

Oct 9-12:22 PM

Physics Chapter 2 Review

Grade: 12th

Subject: Motion

Date: 10/9/12

Oct 9-9:43 AM

1 The speed and direction of an object at a particular instant is its instantaneous velocity

True

False

Oct 9-9:46 AM

2 Another term given for the size of a vector

Oct 9-9:47 AM

3 A ratio of the change in position to the time interval during which the change occured is...

A distance
B scalar
C average velocity

Oct 9-9:49 AM

4 The zero point on a coordinate system is the...

Oct 9-9:49 AM

5 The final time minus the initial time is the....

Oct 9-9:50 AM

6 The absolute value of the slope of a position time graph is the....

A average speed
B average velocity
C vector

Oct 9-9:51 AM

7 A simplified motion diagram shows that the object in motion as a series of points is a particle model

True
False

Oct 9-9:52 AM

8 A series of images showing the position of a moving object over equal time intervals is a ...

Oct 9-9:53 AM

9 In the particle model, the object in motion is reprsented by a series of single points

True

False

Oct 9-9:54 AM

10 A vector has both location and direction

True

False

Oct 9-9:54 AM

11 A scalar is a measurement that does not have a direction

True

False

Oct 9-9:55 AM

12 The length of a displacement vector represents how far an object...

A is visible
B traveled in one direction
C can be stretched

Oct 9-9:56 AM

13 The average speed is _____ the average velocity

A the same as
B the absolute value of
C the indirect value of

Oct 9-9:57 AM

14 A object's velocity is how fast it is moving and _____

A how far it has been
B in what direction it is moving
C its instantaneous position

Oct 9-9:58 AM

15 A boy rides his bike at 20 m/s for a minute. How far does he travel in meters?

Oct 4-10:52 AM

16 How fast was the boy traveling if he covered the same distance in 24 seconds (in m/s)?

Oct 9-10:43 AM